

biochip channels where hybridization of labeled DNA HIV1 (TB) gene probes with complementary bound-DNA fragments had occurred. This figure shows the simultaneous detection of HIV, TB and Goat IgG protein using HIV DNA probe (4 channels corresponding to the first row of the biochip), TB DNA probe (second row), and antibody probe for Goat IgG (fourth row). The blank signals (which correspond to DNA that is not complementary to the probes, or antigens not targeted by the antibody probes) are shown in the third row for comparison. The results demonstrate the use of the multifunctional biochip to detect more than one [diverse biotarget] type of macromolecule on a single chip device. --

In the Abstract

Please substitute the attached new page 95, Abstract of the Disclosure for the original Abstract of the Disclosure.

In the Claims

Please amend Claims 42-69 as follows:

42. (Amended) An integrated biosensor system for the simultaneous detection of a plurality of different types of targets, said system comprising:

at least one sampling platform, said sampling platform including a plurality of receptors for binding to said targets, said plurality of receptors including at least one protein receptor and at least one nucleic acid receptor;

at least one excitation source of electromagnetic radiation at a first frequency for irradiating said receptors, wherein electromagnetic radiation at a second frequency different from said first frequency is emitted in response to said irradiating when at least one of said plurality of different types of targets are bound to said plurality of receptor probes, and

an integrated circuit detector system having a plurality of detection channels for detecting electromagnetic radiation at said second frequency, said detection channels each including at least one detector.

43. (Amended) The integrated biosensor system of claim 42, wherein said sampling platform comprises a solid support.

44. (Amended) The integrated biosensor system of claim 42, wherein said plurality of targets include at least one selected from the group consisting of a bacterium, a fungus, a virus, and an eukaryotic microorganism.

45. (Amended) The integrated biosensor system of claim 42, wherein said plurality of targets include at least one selected from the group consisting of polynucleotides, polypeptides and peptides.

46. (Amended) The integrated biosensor system of claim 43, wherein said solid support comprises at least one selected from the group consisting of a substrate, a filter, and a membrane.

47. (Amended) The integrated biosensor system of claim 43, wherein said solid support prevents transmission of certain wavelengths of said electromagnetic signals.

48. (Amended) The integrated biosensor system of claim 43, wherein said solid support further comprises an optical filter or a lens.

49. (Amended) The integrated biosensor system of claim 42, wherein each said plurality of receptors include at least one selected from the group consisting of a biomimetic, a cell receptor and an intact biological cell.

50. (Amended) The integrated biosensor system of claim 49, wherein said plurality of receptors include at least one selected from the group consisting of a chemical receptor, a bioreceptor and a biopolymer.

51. (Amended) The integrated biosensor system of claim 49, wherein said plurality of receptors include at least one biomimetic material, said biomimetic material comprising at least one selected from the group consisting of a molecular imprint material and a cyclodextrin probe.

52. (Amended) The integrated biosensor system of claim 42, wherein said at least one excitation source of electromagnetic radiation comprises at least one selected from the group consisting of a light emitting diode, a diode array, a laser and a laser array.

53. (Amended) The integrated biosensor system of claim 52, wherein said excitation source is disposed on-chip.

54. (Amended) The integrated biosensor system of claim 52, wherein said excitation source is disposed off-chip.

55. (Amended) The integrated biosensor system of claim 42, wherein said detection channels include a photodetector.

56. (Amended) The integrated biosensor system of claim 55, wherein said photodetector is at least one selected from the group consisting of a photodiode, an avalanche photodiode and a phototransistor.

57. (Amended) The integrated biosensor system of claim 42, further comprising an on-chip signal amplification system or an on-chip signal processing system.

58. (Amended) The integrated biosensor system of claim 57, wherein said on-chip signal amplification system or said on-chip signal processing system further comprises a microprocessor or an amplifier.

59. (Amended) The integrated biosensor system of claim 42, wherein said detection channels further comprise a transimpedance amplifier or a low-pass filter.

60. (Amended) The integrated biosensor system of claim 42, wherein said plurality of receptors are tagged with a label that responds to incident electromagnetic radiation by emitting or absorbing distinct electromagnetic responses, each response having a different frequency.

61. (Amended) The integrated biosensor system of claim 60, wherein said electromagnetic responses are at least one selected from the group consisting of luminescence scattering, infrared absorption and ultraviolet absorption.

62. (Amended) The integrated biosensor system of claim 42, wherein said plurality of receptors respond to electromagnetic irradiation by radiating a luminous signal.

63. (Amended) The integrated biosensor system of claim 62, wherein said luminous signal is in the visible or near-infrared region of the electromagnetic spectrum.

64. (Amended) The integrated biosensor system of claim 45, wherein said polynucleotides comprises at least one selected from the group consisting of DNA, PNA and RNA.

65. (Amended) The integrated biosensor system of claim 42, wherein the detection channels further comprises an amplifier.

66. (Amended) The integrated biosensor system of claim 42, wherein said detection channels include optical detectors and amplifiers, said optical detectors and amplifiers being integrated on a single circuit.

67. (Amended) The integrated biosensor system of claim 42, wherein the plurality of detection channels comprises an array of n-well amplifier photodiodes.

68. (Amended) A method for the simultaneous detection of a plurality of different types of targets in a sample, said method comprising the steps of :

contacting said integrated biosensor system of claim 42 with said sample, wherein binding events occur at respective ones of said plurality of receptors when at least one of said plurality of different types of targets are present in said sample;

irradiating at least a portion of said plurality of receptors with light or other electromagnetic radiation at a first frequency, wherein electromagnetic radiation at a second frequency different from said first frequency is emitted in response to said irradiating when at least one of said plurality of different types of targets are bound to said plurality of receptor probes,

measuring said electromagnetic radiation at a second frequency, and,  
determining the presence or absence of said plurality of different types of targets in said sample.

69. (Amended) A method for detecting a plurality of different pathogens in a sample, comprising the steps of:

contacting said integrated circuit of claim 42 with said sample, wherein one or more of said plurality of receptors is specific for each of said pathogens ,wherein binding events occur at respective ones of said plurality of receptors when at least one of said plurality of different pathogens are present in said sample;

irradiating at least a portion of said plurality of plurality of receptors, wherein electromagnetic radiation at a second frequency different from said first frequency is emitted in response to said irradiating when at least one of said pathogens are bound to said plurality of receptor probes;

measuring said electromagnetic radiation at a second frequency, and,  
determining the presence or absence of said plurality of pathogens in said sample.